

ALE Analytics

A microbial data warehouse and analytical suite

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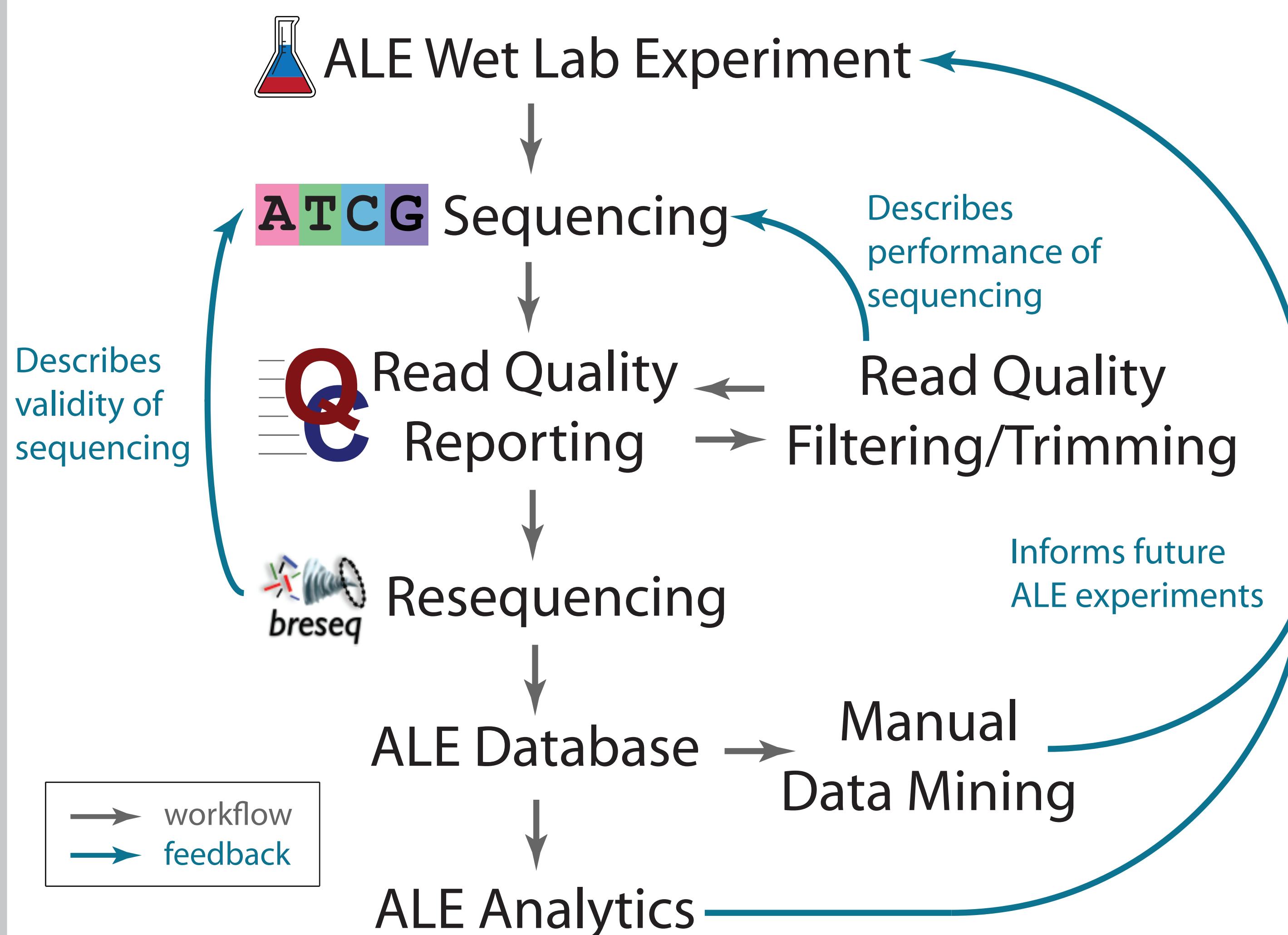


Abstract

Adaptive Laboratory Evolution (ALE) is a powerful experimental tool used by academic and industrial labs for a number of applications. ALE experiments generate a substantial amount of data, coming in the form of sequencing reads, alignment reports, and sample metadata. As ALE experiments scale to include more samples, the task of managing this data comes at higher costs due to the effort necessary to organize and integrate data into a format that describes the evolution process succinctly. In this work, we describe the development, deployment and iteration of an 'ALE Analytics' pipeline and web platform that streamlines the necessary ALE experiment data post-processing, manages experiment data, and produces interactive reports that detail an ALE experiment. Our design has been primarily driven by the need to consolidate large amounts of ALE experimental data in such a way to describe the quality of the sample sequencing, adaptive mutations in evolved strains, the context of mutations via their metadata (i.e., culturing environments, strain properties), and related mutations found in other experiments housed in the database. We have done so by leveraging a full stack of technologies that enable the parsing and databasing of experiment data, the execution of automated analysis on said data and the generation of web accessible reports. Future efforts will take full advantage of this developing platform to enable more depth and breadth of ALE experiment analysis with quicker turnaround.

ALE Mutation Processing Pipeline

Our ALE pipeline leverages industry established tools to process and refine ALE replicate sequencing data to identify genomic perturbations and integrate them into a database that can be mined for mutational trends.

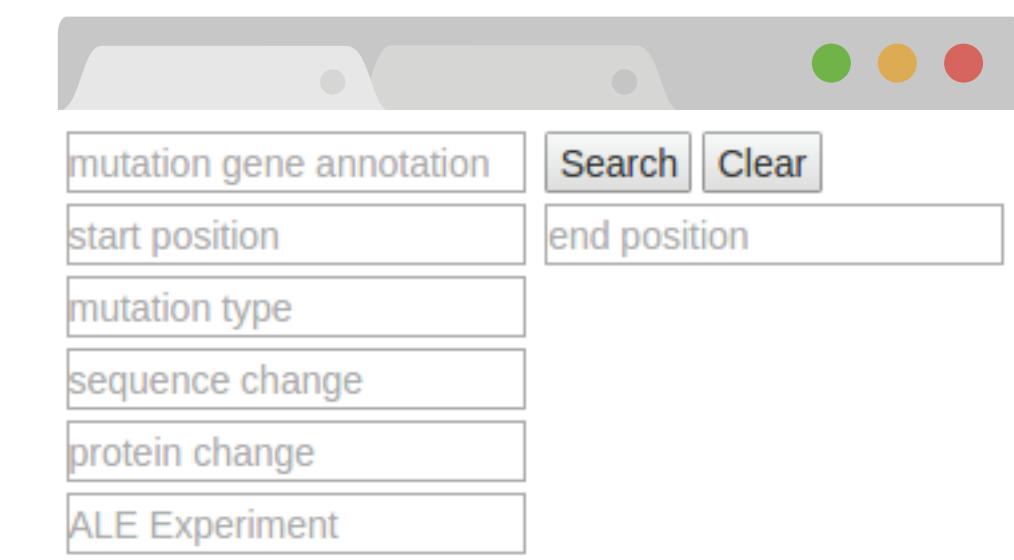


Features and Advantages

- Supports multiple bacterial strains.
- Leverages established tools: Breseq, FastQC, FASTX-Toolkit, etc.
- Automated multi-sample processing for specific stages.
- Stage dependent feedback.
- Feedback provides opportunity for experiment and data refinement.

ALE Analytics Web Platform

The ALE Analytics web platform integrates our ALE mutation analysis with published multi-omics data and better enables identification of causal mutations in ALE experiments.



References

Original paper and those I report biological findings on. Additionally, any 3rd party software I mention.

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Future Directions

- Use whole ALE Database statistics to rank the novelty of causal mutations. An ALE experiment's mutated gene found to have few mutations within the ALE Database can be considered relatively stable and is therefore more significant than a mutated gene with many ALE Database mutations.
- Integrate ALE experiment fitness data to provide additional context for identifying causal mutations.

